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ON THE LONG-PERIOD TROPOSPHERE-IONOSPHERE REGIONAL CONNECTIONS AND THE SYNOPTICAL REVELATION OF THEM

SUMMARY

1. A wide network of ionospheric stations created during the IGY period, accuracy rise in ionospheric measurements and accumulation of abundant statistical data make it possible to set the task both thorough and regional synoptical investigations of the ionosphere.

It is now possible to treat as well established facts the existence of two effects in ionospheric synoptics.

The first effect refers to a distinctly expressed correlation of some current ionospheric characteristics and current tropospheric situation. /Johnes and Johnes(1),S.Bauer (2), D.Martin (3,4), J.Bannon and F.W.Wood (5)/.

The second type of tropospheric-ionospheric relations embraces slowly developing interaction processes of the character of long-lasting regional disturbances (6,7).

The task of the present communication is to ground some assumptions on the working out of the programme of investigating the correlation between tropospheric and ionospheric synoptics to check up the existence of regional ionospheric anomalies of a climatic nature.

2. In order to detect the most interesting points on the ionospheric maps of USSR, maximum median values of $f^{\circ}F2$ for January, March, June and October 1950 and 1952 were compared for 7 stations of the Soviet Union.

To make the comparison three stations were picked up lying on the same geographical latitude within the accuracy of 1°, on geomagnetic latitudes differing by no more than 1° but in different climatic regions- the centre of the European part of the USSR, Urals and West Siberia (Moscow, Sverdlovsk,Tomsk); three stations located in a more southern belt of geomagnetic latitudes (from 43.2 to 33°), also

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different climatic regions the Azov Sea, Kazakhstan, Ba... Rostov on the Don, Alma-Ata, Irkutsk) and the most southern ionospheric station of the USSR in Ashkhabad representing typical features of the climate of subtropical deserts of Central Asia.

Following the new climate classification of A.I.Kaygorodov (8) these points correspond to the climatic regions:

Moscow	$\frac{IV}{-II}$; 2.2	Rostov on Don	$\frac{V}{-I}$; 3.3
Sverdlovsk	$\frac{III}{-II}$, 2,3	Alma-Ata	$\frac{V}{-I}$; 3.4
Tomsk	$\frac{III}{-III}$; 2.4	Irkutsk	$\frac{IV}{-III}$; 1.4
		Ashkhabad	$\frac{VI}{\theta}$; 1.2

The effect pointed out formerly (6) is fully reproduced both in 1950 and 1952, precisely: "The layer F2 of ionosphere located over geographical regions with a distinct difference of winter and summer has a more sharply expressed season variation under all other equal conditions.

An extremely typical feature is a full coincidence of summer value of $f^{9}F.2$ for Tomsk, Moscow and Sverdlovsk at the presence of some divergence of the geomagnetic latitudes. This coincidence agrees with a similar climatic coincidence of June in the three climatic regions. Those are the regional peculiarities which can be compared with mean characteristics of troposphere for a lasting period.

3. To discuss the possible mechanism of correlation between the climatic maps of ionosphere and troposhere at the example of the Siberian anomaly we shall pick up only one side of the problem connected with peculiarities of circulation in the region of stable anticyclone.

A stagnation of big air masses, typical for winters of a characteristic continental type, leads to a simplification of the interaction between troposphere and mesosphere. We can assume that under such conditions the relation between long-period variations of pressure and density in troposphere and

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ionosphere acquires the character of a statistical balance, a rough model of which is the transmission of pressure and density variations up according to the barometrical formula.

Dynamical processes in the ionosphere characterized by winds should be then associated with a given geographical area due to the fact that phenomena of a geostrophical wind at the level of the ionosphere do not take place. The movement of ionized masses into the Earth's magnetic field cannot be regarded as a movement without friction at the presence of a pressure gradient and a Coriolis force. The ionized sphere is to a certain extent convected by the Earth's magnetic field with accompanying some magneto-hydrodynamical phenomena.

To make a thorough study of changes in the nature of the troposphero-ionospheric relations it is necessary to further develop the general theory of atmospheric circulation considering the magneto-hydrodynamical phenomena in the ionosphere.

The experimental material should include data on vertical profiles with account of pressure and velocity of the winds.

In this direction there are now some data obtained under the IGY program of observations of upper atmosphere.

To get some data it is necessary to make new experiments.

4. The following proposals are put forward for consideration.

a) The compilation of averaged ionospheric sinoptical maps showing regions anomalies to be included in the programme of processing the IGY materials on ionosphere and troposphere.

b) The comparison of world sinoptic maps of regional ionospheric anomalies to be made with maps of barical anomalies.

c) The possibilites to be studied of a thorough investigation of circulation processes from troposphere to ionosphere with the use of optical and location observations of winds.

d) A special simposium to be prepared on the problems of the theory of regional and local troposphero-ionospheric relations.

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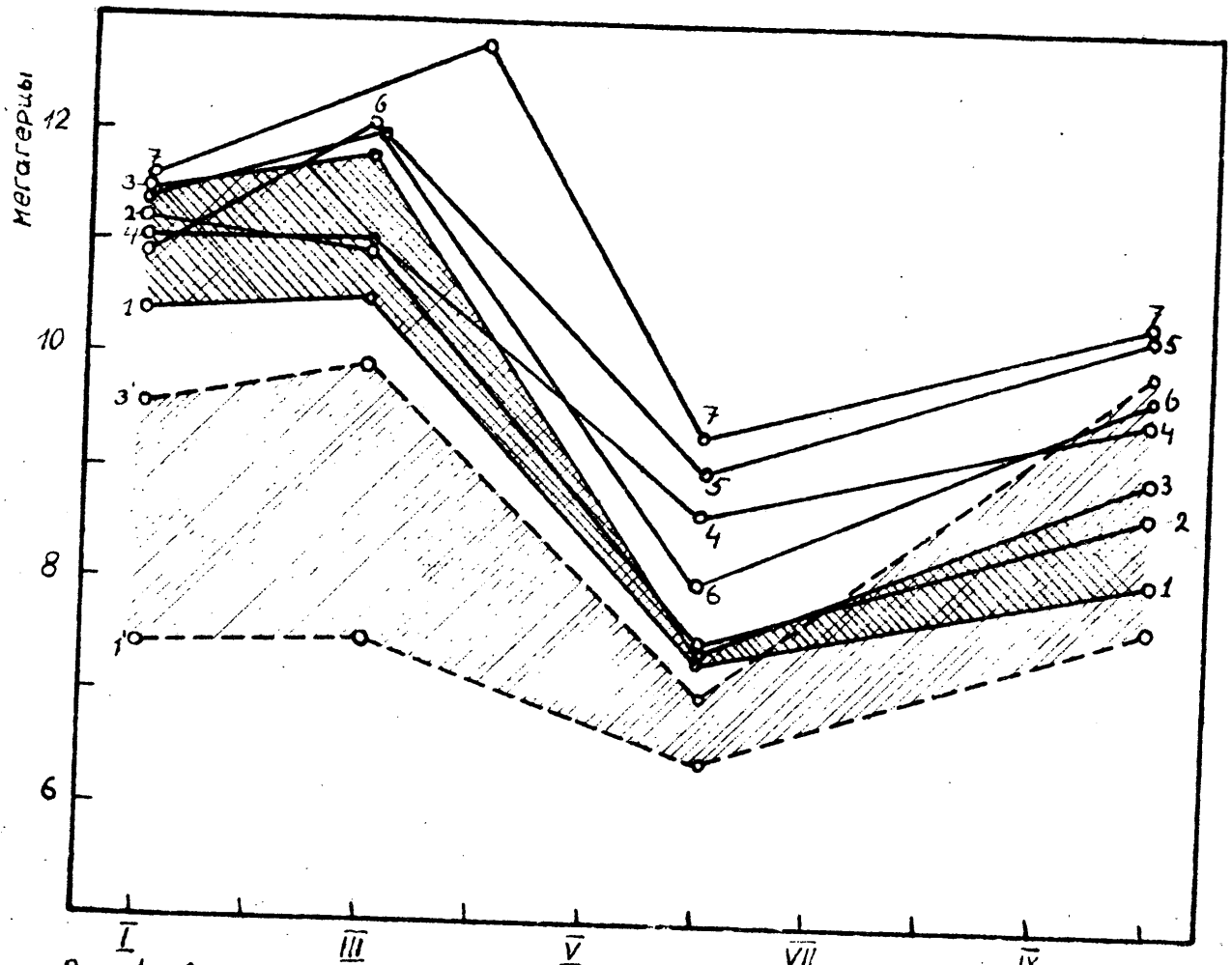

Рис. 1. Сезонные изменения 1950г. месячных максимальных медиан $f^{\circ}F2$ для станций: 1. Москва, 2. Свердловск, 3. Томск, 4. Ростов на Д., 5. Алма-Ата, 6. Иркутск, 7. Ашхабад; 1' и 3' - Москва и Томск за 1940г.

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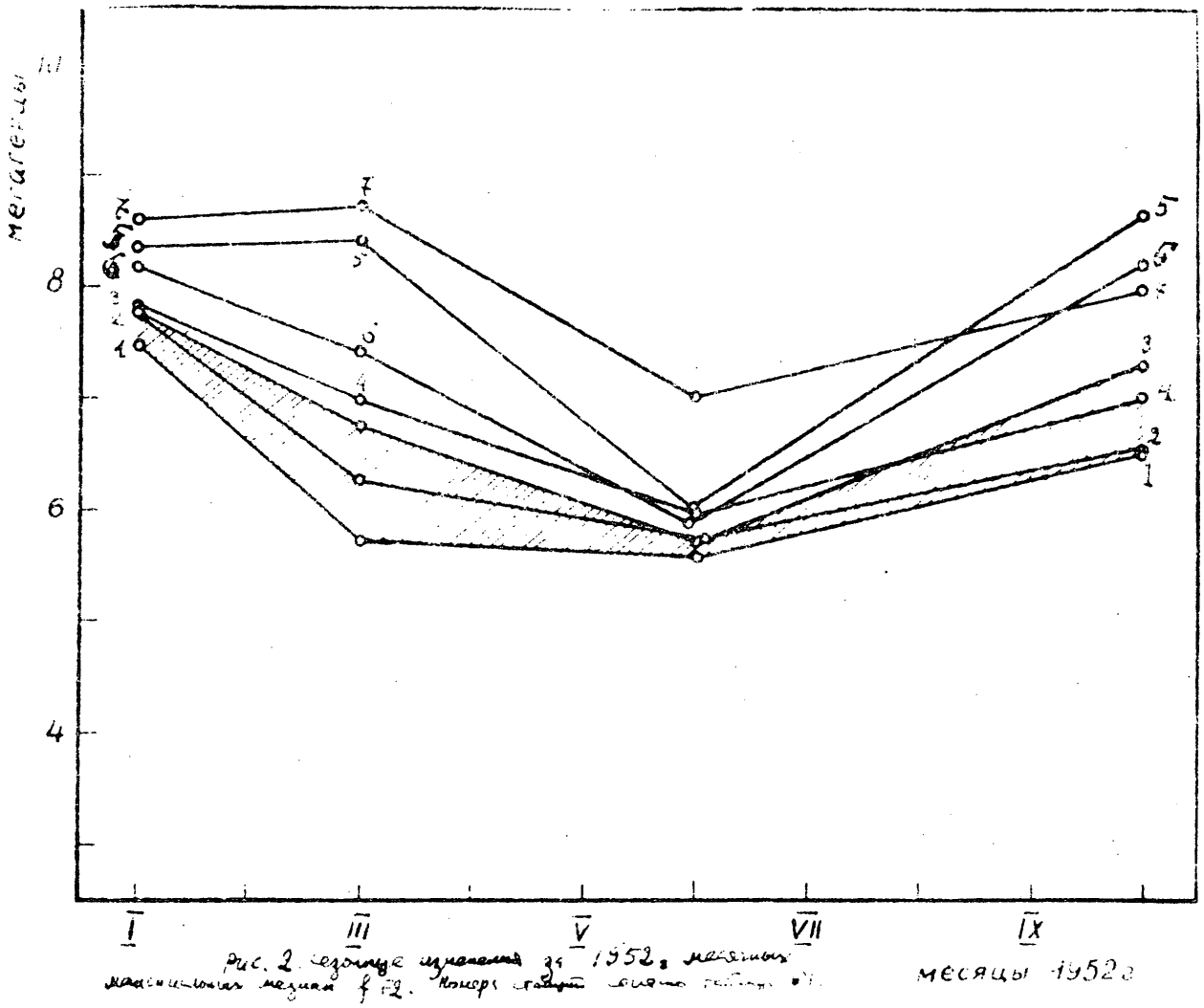

Рис. 2. Сезонные изменения за 1952 г. месяцев

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